

Executive Briefing: Analysing the Ship-Shore Interface in Off-Spec LPG Disputes

Category: LPG & Gas Carrier Disputes / Operational Causation

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Commercial disputes arising from the delivery of off-specification Liquefied Petroleum Gas (LPG) cargoes are among the most technically complex and financially significant claims in maritime transport. When a terminal or receiver claims that a cargo has failed to meet the contractual specification - whether due to high moisture content, elevated sulphur compounds, composition variations, residues, or particulate contamination - the immediate focus often falls on the vessel's cargo tanks.

However, from a command and operational perspective, the fact that an off-spec cargo was found on board does not by itself establish shipboard causation. A proper review must examine the entire transfer chain: the shore tank, shore lines and loading arms, the ship-shore interface, the sampling process, the condition of the vessel's cargo tanks, and the loading operation itself.

For P&I clubs, cargo underwriters, and legal counsel evaluating liability exposure, an independent technical review of this interface is important in determining whether the cause lies on the ship side, the shore side, or results from the interaction between the two.

The Pre-Loading Trap: Line Displacement and “Dead Legs”

The ship-shore interface begins long before the first metric tonne of liquid passes the manifold. Contamination may arise when shore facilities fail to properly purge, flush, isolate, or account for the contents of their pipeline network before loading commences.

Shore lines can be long and complex, with branches, low points, and “dead legs” where remnants of a previous product, moisture, or residues may remain.

- **The Exposure:** If the existing shore-line contents are displaced into the vessel's cargo tanks by the incoming cargo without an agreed segregation, displacement, and sampling procedure, contamination present in the shore system may be transferred directly on board.

- **The Evidence Filter:** In a subsequent dispute, the terminal may rely on an off-spec manifold sample. However, the review must establish the shore-line volume, previous product, line-up, valve-opening times, displacement destination, flow rate, and the exact time and method of sampling. A sample drawn before the line displacement was completed may reflect the contents of the shore line rather than the representative quality of the cargo being delivered.

Manifold Sampling vs. a Representative Cargo Sample

In LPG operations, sampling is not a routine bottle-sampling exercise. The method must match the intended analysis. ASTM D1265 covers the equipment and procedures used to obtain representative samples of specification LPG and is commonly applied to routine specification testing. Where preservation of light components and accurate composition are critical, floating-piston sampling under ASTM D3700 may be more appropriate. GPA 2174 addresses the sampling of homogeneous, single-phase pressurised liquid hydrocarbons. The equipment, sample-cylinder condition, pressure control, flushing, and chain of custody all matter.

Considerable weight may be placed on a “manifold sample” taken at the very commencement of loading.

- **The Analytical Weakness:** A sample taken during the initial line displacement represents the product passing the sampling point at that particular time. Its evidential value depends on whether the line displacement had been completed, the flow was stable, the sample point was properly conditioned, and the correct procedure was followed. It should not automatically be treated as representative of the entire cargo.
- **The Evidence Review:** The review should examine the manifold sample log, sample-cylinder identification and seals, sampling time, line pressure, temperature and flow, ship and shore valve sequence, laboratory method, and the vessel’s manifold and cargo-tank records. Where these elements cannot be verified, the reliability and evidential weight of the sample must be treated with caution.

Pressure, Temperature, and Cargo Composition

LPG cargo behaviour depends on the relationship between pressure, temperature, composition, containment type, and vapour handling. A difference in cargo composition may be blamed on the vessel’s reliquefaction plant or compressors, but this should never be assumed without examining the actual operating data.

The following points require particular attention at the ship-shore interface:

1. **Vapour Return and Pressure Control:** Depending on the vessel, cargo, and terminal arrangement, loading may involve a shore vapour-return line, the vessel's reliquefaction plant, or a combination of both. If the vapour-return capacity is unavailable or restricted, the effect on tank pressure, cargo temperature, compressor operation, loading rate, and any venting or boil-off must be examined. Any allegation that these operations changed the propane/butane ratio must be supported by pressure and temperature trends, representative samples and, where appropriate, a mass-balance assessment - not by assumption alone.
2. **Cargo Heel and Commingling:** On refrigerated or semi-refrigerated gas carriers, a cargo heel may be retained to maintain the cargo tanks in the required condition. Its quantity, composition, and compatibility with the incoming product must be assessed against the loading plan and the declared shore-tank specification. Incorrect or incomplete shore information may contribute to an off-spec result. Equally, the vessel must accurately declare and manage any heel remaining on board.

Preserving the Evidence: The Role of an Immediate Independent Technical Review

When a P&I club, cargo underwriter, or law firm receives notice of an off-spec LPG dispute, delaying the technical review until formal proceedings have commenced may allow important evidence to be lost, overwritten, or made difficult to verify once the vessel sails and the terminal realigns its system for the next operation.

An immediate, independent technical review should focus on:

- **The Cargo Operation and Custody-Transfer Records:** Correlating ship and shore valve-opening times, loading rates, pressure and temperature trends, interruptions, ESD events, and the exact commencement and completion of line displacement.
- **The Sampling Records and Chain of Custody:** Checking the sampling point, timing, method, cylinder type and condition, seals, witnesses, sample handling, laboratory method, and whether retained samples remain available for joint testing.
- **The Cargo-Tank Preparation and Terminal-Line History:** Reviewing the vessel's previous cargo, heel declaration, tank preparation, inerting, gassing-up, cooling-down, dryness or dew-point records where applicable, together with the products previously handled through the relevant shore line, the line volume, displacement procedure, shore-tank analysis, and loading-arm history.

Conclusion

In off-spec LPG disputes, the location where the non-conformity is discovered does not, by itself, establish where or how it arose. A proper technical review should examine the full cargo-transfer sequence, including shore-line condition, tank preparation, pressure and temperature records, sampling arrangements, cargo compatibility and the timing of each operational step. Only after the ship-side and shore-side evidence has been assessed together can a sound conclusion on causation and responsibility be reached.

About the Author

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This article is intended as general technical commentary and does not address the facts of any specific dispute or constitute legal advice.